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Teratological data on Bulgarian Gastropoda (Mollusca)

P. MITOV, I. DEDOV & I. STOYANOV

A b s t r a c t : During faunistic investigations in diverse regions of Bulgaria, 8 gastropod specimens (6 species) with diverse morphological anomalies of the shell and body were found. These include specimens of: 1) *Rapana venosa* (VALENCIENNES 1846) with atypical, high-conic (scalarid) shells; 2) *Planorbis planorbis* (LINNAEUS 1758) with an aberrantly (deviation from the coiling surface) coiled shell; 3) *Stagnicola palustris* (O. F. MÜLLER 1774) with an entirely uncoiled shell; 4) *Laciniaria plicata* (DRAPARNAUD 1801) with abnormally uncoiled last whorl accompanied with a bend of the axis of the shell spires; 5) *Limax (Limax) punctulatus* SORDELLI 1870 with an abnormal formation of the posterior part of foot; and 6) *Helix pomatia rhodopensis* KOBELT 1906 with an oddly shaped ommathophore. These observations are attributed to mechanical injuries (traumatic or caused by parasite invasion through the mantle), genetic anomalies, atavisms, and regenerative processes.

K e y w o r d s : Gastropoda, anomalies, Bulgaria.

Introduction

In the malacological literature, many anomalies of the shell (ROSSMÄSSLER 1835, 1837, 1914, SIMROTH 1908, 1928, SLAVÍK 1869, ULIČNÝ 1892, FRANKENBERGER 1912, GEYER 1927, KNIGHTA 1930, PETRBOK 1939, 1943, DUCHON 1943, SCHILDER & SCHILDER 1953 (after KOVANDA 1956), ROTARIDES & SCHLESCH 1951, KOVANDA 1956, JACKIEWICZ 1965, PETRUCCIOLI 1996 among others), the body (SIMROTH 1908 among others), and the radulae (BECK 1912 (after SIMROTH 1908), BOR et al. 1994 among others) in various gastropods are reported. The only information concerning teratological data about Bulgarian snails is provided by SMAGOWICZ (1989), who reports shell anomalies in the marine snail *Rapana venosa* (sub *Rapana thomassiana*).

The mentioned importance of the anomalies and the lack of such data on snails from Bulgaria led us to pay special attention to the teratology of this animal group as more and more abnormal accumulated during the many faunistic studies on the Bulgarian gastropods.

Materials and methods

As a result of intensive hand-collecting, anomalous snails were found at the following localities (the numbers of the corresponding locality is included in each entry in the "Material examined" section):

1. Predbalkan, Distr. Cherven Bryag, Village Reselets, river Ruchene, 200-300 m a. s. l., 26.VII.1992, leg. P. Mitov (UTM-KH59).
2. North Black Sea Coast, Zlatni Piasatzi aquatory, "Aladzha" *Mytilus galloprovincialis*-bank, 10 m depth, VI. - IX. 1996, leg. V. Vasilev (UTM-NH 89).
3. Distr. Lovech, Village Golyama Zhelyazna, in the region of Toplya cave, 550 m a. s. l., 27.IX.1997, leg. P. Mitov (UTM-KH 96).
4. City of Sofia, Borissovata gradina, artificial pond, 550 m, a. s. l., X.1999, V. Biserkov leg. (UTM-FN 82/92; FN 83/93).
5. Rhodopi Mts., Distr. Smolyan, near the road Pamporovo-Village Stoykite, 1400 m a. s. l., 26.VI.1998, leg. I. Dedov (UTM-LG 01).
6. Rhodopi Mts., Distr. Smolyan, Village Oryahovets, 780 m a. s. l., 20-23.IV.1998, leg. P. Mitov (UTM-LG 30).

The materials were determined by I. Dedov and P. Mitov and are presently kept in their private collections. The nomenclature of gastropods follows GROSSU (1993) and DEDOV (1998). The photographs were taken by M. Mihailov and I. Stoyanov. All measurements are in millimeters (mm).

Abbreviations used in the text

| | |
|-----------|-------------------------------------|
| bl..... | body length |
| DC | in coll. I. Dedov |
| H | height of shell |
| ha | height of aperture |
| hs | height of spires |
| htr | height of the particular teratology |
| lm..... | length of mantle |
| loc..... | locality |
| MC..... | in coll. P. Mitov |
| N..... | number of shell-whorls |
| W..... | width of shell |
| wa | width of aperture |

Results

As a result of our faunistic investigations on Bulgarian snails, during the period 1992-1999, 8 abnormal specimens, classified in 6 species were found. The observed anomalies may be lumped into two groups:

1. Anomalies concerning the shell:

M a t e r i a l e x a m i n e d : *Rapana venosa* (VALENCIENNES 1846) (=*R. thomasianna* CROSSE 1861; *R. pontica* NORDSIECK 1969; *R. bezoar* GROSSU 1962) (syn. after GROSSU 1993) (Rapanidae ADAMS 1853) - (2 specimens, loc.-2, DC & MC) (Figs 1, 2).

D e s c r i p t i o n : The abnormal snails possessed high-conic (scalarid) shells. The shell parameters of the two specimens are H=87.7, W=45.8, ha=54.3, wa=26.0, hs=39.1, N=6 (DC) (Fig. 1), and H=90.7, W=55.5, ha=60.6, wa=35.1, hs=36.0, N=?5 (the apex broken off), respectively (MC) (Fig. 2). According to the personal communication of Dr. V. Vasilev, who has collected these specimens, such anomalies occur at a ratio 1:10 000.

M a t e r i a l e x a m i n e d : *Planorbis planorbis* (LINNAEUS 1758) (Planorbidae RAFINESQUE 1815) - (1 specimen, loc.-1, MC) (Fig. 3).

D e s c r i p t i o n : The specimen consists of a shell, whose whorls are not positioned in one plane as usual ($H=3.96$, $W=9.0$, $ha=2.64$, $wa=3.6$, $N=4.5$, $htr=6.0$).

M a t e r i a l e x a m i n e d : *Stagnicola palustris* (O.F. MÜLLER 1774) (Lymnaeidae RAFINESQUE 1815) - (1 specimen, loc.-4, DC) (Fig. 4).

D e s c r i p t i o n : The anomalous specimen has a completely uncoiled shell ($H=31.08$, $W=12.24$, $ha=10.32$, $wa=7.08$, $N=4$, $htr=L$).

M a t e r i a l e x a m i n e d : *Laciniaria plicata* (DRAPARNAUD 1801) (Clausiliidae SCHMIDT 1857) - (2 specimens, loc.-3, MC) (Fig. 5).

D e s c r i p t i o n : One of the specimens (Fig. 5a) has an aberrantly decoiled last whorl of the shell ($H=19.08$, $W=4.32$, $ha=3.6$, $wa=2.88$, $N=13$, $htr=7.92$), and the other ($H=8.0$, $W=3.9$, $ha=4.0$, $wa=2.9$, $N=13$) has the shell deflected along its axis (Fig. 5b).

2. Anomalies concerning the body:

M a t e r i a l e x a m i n e d : *Limax (Limax) punctulatus* SORDELLI 1870 (Limacidae RAFINESQUE 1815) - (1 specimen, loc.-5, DC) (Fig. 6).

D e s c r i p t i o n : The anomalous specimen ($bl=130-100$ (respectively, live and conserved in ethanol); $lm=29$) has an untypical bifurcation of the posterior part of the foot.

M a t e r i a l e x a m i n e d : *Helix pomatia rhodopensis* KOBELT 1906 (Helicidae RAFINESQUE 1815) - (1 specimen, loc.-6, MC) (Fig. 7).

D e s c r i p t i o n : This abnormal snail specimen has an odd process just above the base of the right ommatophore. The latter is, in comparison to the normal left one, significantly shorter and curved when in maximally stretched condition.

Discussion and conclusions

Concerning the first group of the described anomalies (i. e. those in *Rapana venosa*, *Planorbis planorbis*, *Stagnicola palustris* and *Laciniaria plicata*), it may be suggested that they are results of mechanical injuries, genetic anomalies, physiological perturbations during the growth-phase, or atavistic manifestations (see also SIMROTH 1928, ROTARIDES & SCHLESCH 1951, KOVANDA 1956, JACKIEWICZ 1965). In Bulgaria, strongly elongated shells with a very elongated spire, were firstly observed in *Rapana venosa* (two juvenile specimens, $H=41.8$ and 62 mm) from the aquatory of Obzor and were described by SMAGOWICZ (1989). A similar uncoiling of the shell in a representative of genus *Planorbis* GEOFFROY 1767 was described relatively long ago by SIMROTH (1928), who also states that the simultaneous occurrence of many individuals with such a (scalarid) shell is a result of a parasite invasion in the mantle of the snails, but in the present case the reason for the abnormally coiled shell (with deflection from the coiling surface) in *Planorbis planorbis* may be also a traumatic event. The observed scalarid shell in *Stagnicola palustris* in this case may be explained by a genetic anomaly, an atavistic, or by a parasite invasion similar to the previous example with *Planorbis*. The uncoiling of the last whorls of the shell of *Laciniaria plicata* (Fig. 5a) is most probably the result of a mantle-injury during the break-off in the region of the last whorl or as a result of a fracture in the columella (see for similar cases SIMROTH 1928, p. 122, fig. 33c; ROTARIDES &

SCHLESCH 1951, pl. I, f. 12-17, pl. III, f. 5-8, Jackiewicz 1965, pl. III, f. 10, 13-15, pl. IV, f. 11-12). This opinion is supported by the clearly visible break-off margin and the beginning of the regenerated part. The surface of the latter is not characteristically sculptured with ridges and also supports and rises the margin of the broken shell (Fig. 5a). The most probable cause for the axis deflection in the *Laciniaria plicata* specimen (Fig. 5b) is a mechanical injury of the columella (for similar cases see ROTARIDES & SCHLESCH 1951, p. 83, f. 11; pl. II, f. 13).

The second group of anomalies, connected with untypical formations on the body of the snails, are most probably a result of genetic anomalies or regeneration processes after injuries. Cases of atypical formations on the ommatophores in *Helix pomatia* LINNAEUS 1758 are reported also by YOUNG (1907) (after SIMROTH 1908). Similar formations on the tentacles of freshwater gastropods are found also by BAUER (1908) (after SIMROTH, 1908), in *Lymnaea stagnalis* (LINNAEUS 1758), and by TECHOW (1910) (after SIMROTH 1908) in *Planorbarius corneus* LINNAEUS 1758 (sub *Planorbis corneus*). According to SIMROTH (1908) all these are results of regeneration process after mechanical injuries. The herein reported anomaly in *Limax (Limax) punctulatus* may be attributed also to regenerative events after an injury of the supermuscular tissues of the foot of the snail or to genetic anomalies.

As a conclusion, it may be stated, that the study and description of the anomalies is important, because they appear as a result of the influence of external and internal factors during the embryonic and postembryonal development and thus are of general interest to the embryology, the ecology, the evolutionary theory and the palaeontology. The presented abnormalities are of taxonomical importance too, because they affect some of the important diagnostic characters of the snails.

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Zusammenfassung

Während faunistischen Untersuchungen in verschiedenen Gebieten Bulgariens, wurden 8 Schnecken-Exemplare (6 Spezies) mit mannigfaltigen morphologischen Anomalien der Schale und des Körpers gefunden. 1) *Rapana venosa* (VALENCIENNES 1846) mit atypischer, hoch-konischer (scalariden) Schale; 2) *Planorbis planorbis* (LINNAEUS 1758) mit einer abweichend gewundenen Schale; 3) *Stagnicola palustris* (O.F. MÜLLER 1774) mit einer völlig abgespulten Schale; 4) *Laciniaria plicata* (DRAPARNAUD 1801) mit abnormal abgespulter letzter Windung und mit einer Biegung der Schalenachse; 5) *Limax (Limax) punctulatus* SORDELLI 1870 mit einer abnormalen Formung des hinteren Teil des Fußes; und 6) *Helix pomatia rhodopensis* KOBELT 1906 mit einem eigenartig gestalteten Ommatophoren. Als Ursache für diese morphologische Abweichungen werden mechanische Verletzungen (traumatisch oder durch parasitäre Invasion verursacht), genetische Anomalien, Atavismen, und regenerative Verfahren betrachtet.

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Address of the author: Dr. Plamen Genkov MITOV
Department of Zoology and Anthropology
Faculty of Biology, University of Sofia
8 Dragan Zankov Blvd., BG-1164 Sofia, Bulgaria
E-mail: plamenmitov@web.

Ivailo DEDOV & Ivailo STOYANOV
Central Laboratory of General Ecology
Bulgarian Academy of Sciences
2 Gagarin Street, BG-1113 Sofia, Bulgaria
E-mail: dedov@ecolab.bas.bg

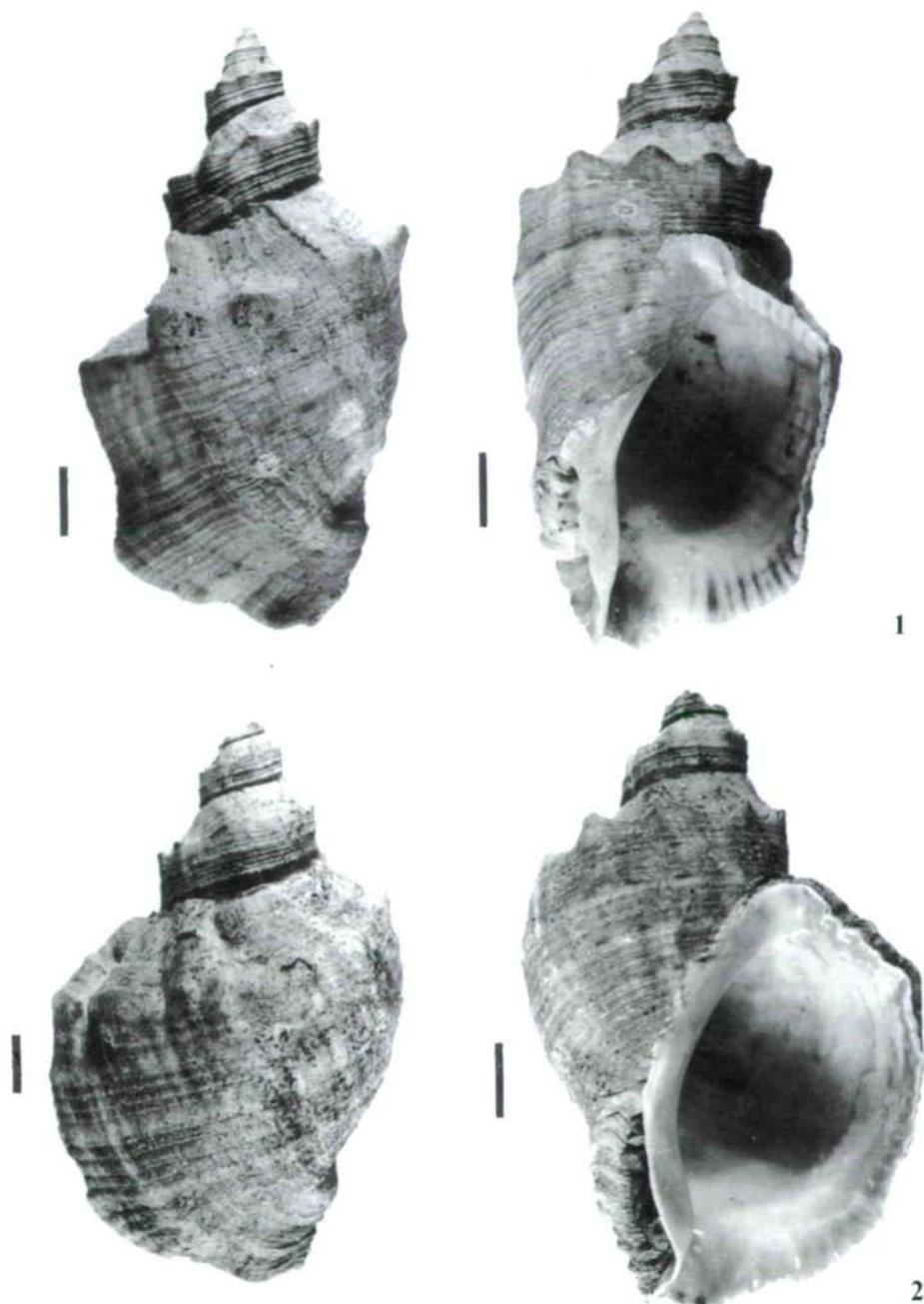


Fig. 1-2. Abnormal shells of *Rapana venosa* (VALENCIENNES 1846) (= *R. thomasi* CROSSE 1861). Scale: 1 cm. Photo: M. Mihailov.

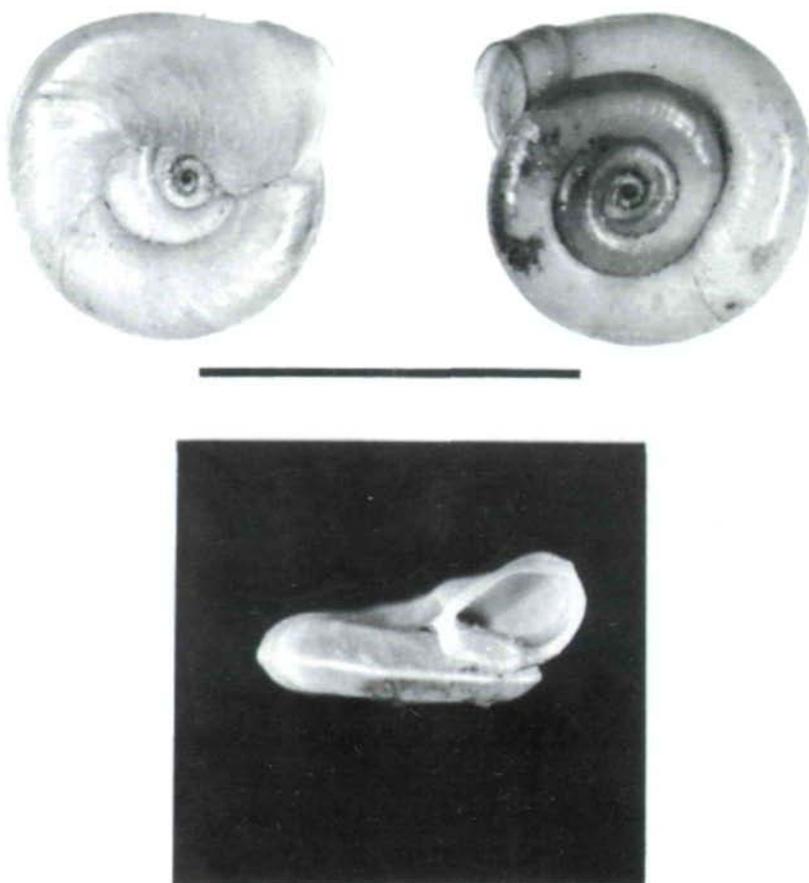


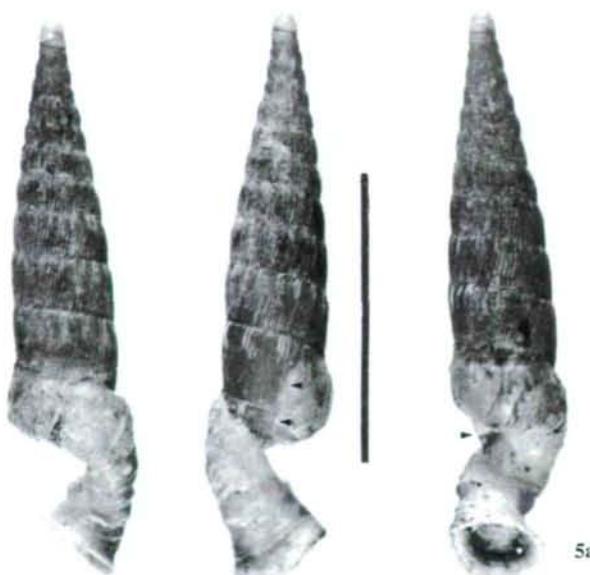
Fig. 3. Abnormal shell of *Planorbis planorbis* (LINNAEUS 1758). Scale: 1 cm. Photo: M. Mihailov.



Fig. 4. Abnormal shell of *Stagnicola palustris* (O.F. MÜLLER 1774). Scale: 1 cm. Photo: M. Mihailov.



5b



5a

Fig. 5. Abnormal shells in *Laciniaria plicata* (DRAPARNAUD 1801). a – with decoiled last whorl, the arrows point at the margin of the broken shell. Scale=1cm; b – deflected along its axis. Scale = 0.5 cm. Photos: M. Mihailov.

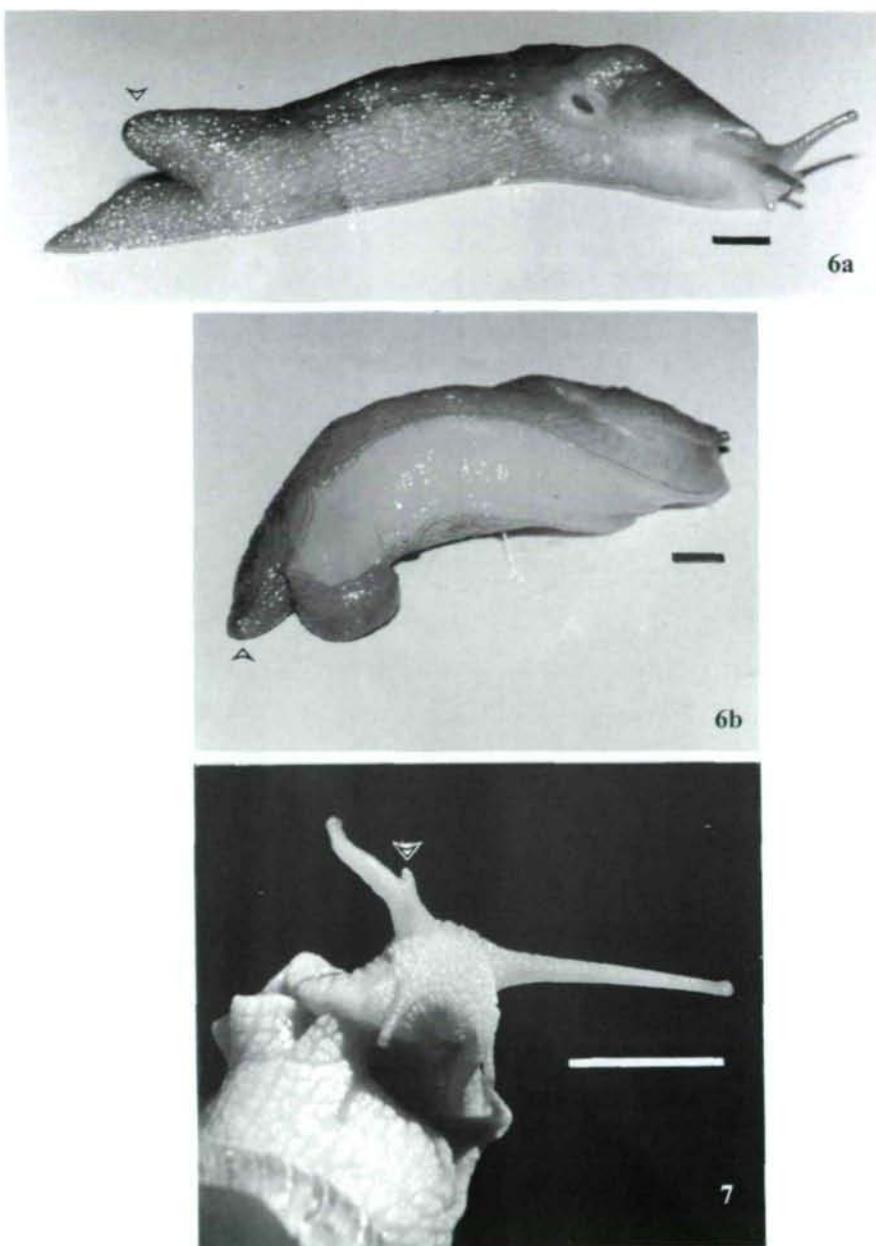


Fig. 6 a, b. Abnormal body structure (marked with arrow) in *Limax (Limax) punctulatus* SORDELLI 1870. Scale: 1 cm. Photo: I. Stoyanov. Fig. 7. Abnormal body structure (marked with arrow) on the right ommatophore in *Helix pomatia rhodopensis* KOBELT, 1906. Scale: 1 cm. Photo: I. Stoyanov.